

ENTOMOLOGY.—*Redescriptions of four species of neotropical Culicoides of the debilipalpis group (Diptera: Heleidae).* WILLIS W. WIRTH<sup>1</sup> and FRANKLIN S. BLANTON.<sup>2</sup> (Communicated by Alan Stone.)

In the course of our taxonomic study of the Panama *Culicoides* of the very difficult *debilipalpis* group, we have restudied type material of several non-Panamanian species for purposes of comparison. We feel that the study of certain characters which were not utilized when these species were described a number of years ago is essential for recognition of species in this group. We therefore take this opportunity to offer redescriptions and figures of four of these species.

We are deeply grateful to Paul Freeman and the trustees of the British Museum (Natural History) for the opportunity to study type material (see discussion under *germanus*) of *dasyophrus* Macfie and *germanus* Macfie from British Guiana. To Irving Fox of the University of Puerto Rico we are equally appreciative of his kindness in lending us the holotypes of *trilineatus* Fox and *hoffmani* Fox from the West Indies.

There are several terms the exact definitions of which are essential to the descriptions. Wing length is measured from the basal arculus to the wing tip; we use the Tillyard modification of the Comstock-Needham terminology of wing veins, thus the two discal forks emit the branches  $M_1$  and  $M_2$  on the anterior fork and  $M_{3+4}$  and  $Cu_1$  on the posterior fork. The antennal ratio is the value obtained by dividing the combined lengths of the last five segments by the combined lengths of the preceding eight. The measurement of the length of the spermatheca includes the sclerotized portion of the duct. Our measurements are of single specimens unless followed by values in parentheses in which case the values are "mean (minimum-maximum,  $n$  = number of measurements)."

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*Culicoides dasyophrus* Macfie

Fig. 1

*Culicoides dasyophrus* Macfie, 1940, Ent. Monthly Mag. **76**: 27 (male, female; British Guiana); Ortiz, 1952, Acta Cient. Venezolana **3**: 126 (Amazonas Terr., Venezuela; female red-described; fig. antenna, spermatheca).

*Characters of female.*—Length of wing 0.74 (0.69–0.76,  $n = 4$ ) mm.

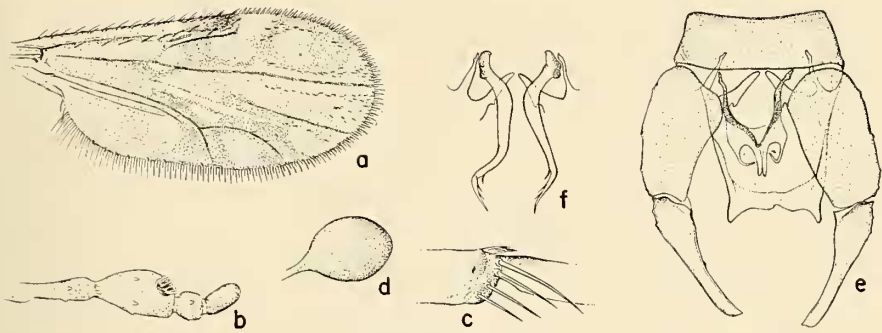
Head: Eyes narrowly separated above, with long interfacetal hairs. Antenna with flagellar segments in proportion of 15:10:10:10:10:10:10:15:18:19:20:33, antennal ratio 1.23; distal sensory tufts present on segments III, VII-X. Palpal segments in proportion of 5:14:14:6:7, third segment swollen, 1.65 times as long as greatest breadth, with a broad, shallow, sensory pit. Mandible with 14 teeth.

Thorax: Mesonotum dark brown with a pair of large, elongated submedian yellowish spots and a pair of obscure, dark-brown vittae laterad of these; scutellum brown in middle, paler on sides. Legs dark brown, fore and mid femur with subapical, all tibiae with subbasal and hind tibia with apical, narrow pale rings; hind tibial comb with 4 spines, the one next to the spur longest.

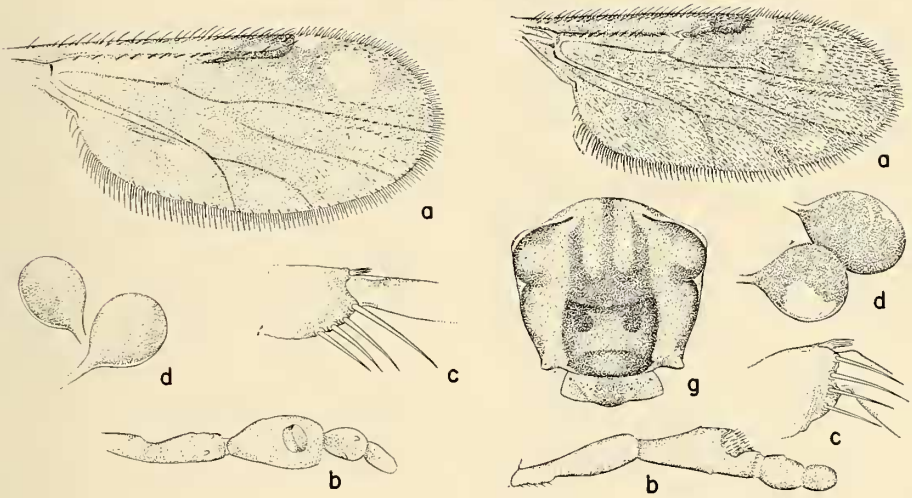
Wing: Pattern as figured, pale spots rather small and not very distinct; poststigmatic pale spots in cell  $R_5$  more or less fused, the posterior one located slightly proximad of the anterior one; distal pale spot in cell  $R_5$  small, only one small pale spot in distal part of anal cell and one pale spot in distal part of cell  $M_2$ ; indistinct pale spot in front of mediocubital fork; macrotrichia sparse on distal third of wing; costa extending to 0.61 of distance to wing tip. Halter whitish.

Abdomen: Dark brown, cerci yellowish; spermatheca one, pyriform, measuring 0.044 by 0.033 mm, the duct narrow and sclerotized for a considerable distance.

*Male genitalia.*—Ninth sternum without caudo-median excavation, the posterior membrane not spiculate; ninth tergum long and tapering, the apicolateral processes short and blunt. Basistyle with ventral root foot-shaped, the caudal heel not long, dorsal root longer and slender; dististyle

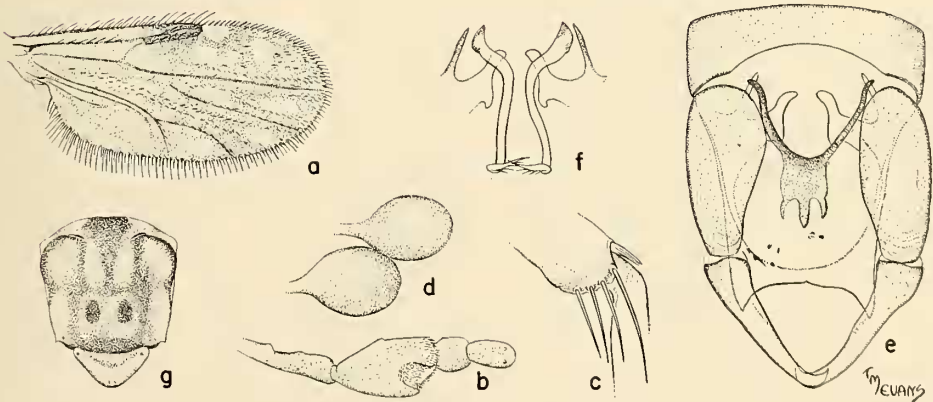


I. DASYOPHRUS



2. GERMANUS

3. TRILINEATUS



4. HOFFMANI

FIGS. 1-4.—1, *Culicoides dasyophrus* (paratype from New River, British Guiana); 2, *Culicoides germanus* (presumed type, New River, British Guiana); 3, *Culicoides trilineatus* (from St. Croix, Virgin Islands); 4, *Culicoides hoffmani* (Puerto Rico; ♂ from Carolina, ♀ from Guyanilla). (a, female wing; b, female palpus; c, apex of hind tibia showing spur and comb of tibial spines, female; d, female spermathecae; e, male genitalia, parameres omitted; f, male parameres; g, thoracic color pattern, female. Drawings by Thomas M. Evans.)

nearly straight, with slender apex. Aedeagus very short and broad, basal arch more than half as high as total length of aedeagus, the transverse anteromesal sclerotized membrane rounded, apex with a short blunt inner sclerotized point enclosed by a short, bluntly conical, hyaline lobe. Parameres each with knobbed base, slender, sinuate stem without apparent ventral lobe and slender, tapering tip with 4 or 5 subapical, lateral barbs.

*Distribution*.—British Guiana, Venezuela.

*Specimens examined*.—As follows:

BRITISH GUIANA: New River, 750 feet, March 20, 1938, C. A. Hudson, 1 male, 7 females (paratypes of *dasyophrus*).

VENEZUELA: Amazonas Territory, 1951, P. Anduze, 7 females.

*Discussion*.—The redescription and illustration of the paratypes from British Guiana are made possible by the generous cooperation of Paul Freeman and the trustees of the British Museum (Natural History), who kindly lent us the material for study. We are also indebted to I. Ortiz for the gift of Venezuela specimens from the same collection upon which he reported in 1952. We are thus able to confirm Ortiz's determination of this species by direct comparison with type material. Barbosa's record (1947, An. Soc. Biol. Pernambuco 7: 14) and figure of the male genitalia of *dasyophrus* from Panama, however, are erroneous, and specimens from Barro Colorado Island in the U. S. National Museum labeled *dasyophrus* by Barbosa are actually *castillae* Fox.

The long distal five antennal segments, the presence of sensoria on segments III, VII–X, the short, broad, third palpal segment, the prominent mesonotal pattern, the obscure wing pattern with only one distal spot each in anal cell and cell  $M_2$ , and the pale apex of the hind tibia will serve to characterize *dasyophrus*.

#### *Culicoides germanus* Macfie

Fig. 2

*Culicoides germanus* Macfie, 1940, Ent. Monthly Mag. 76: 27 (female; British Guiana).

*Characters of female*.—Length of wing 0.79 mm. The head was not dissected from the body and can be seen only in side view. Eye apparently hairy above, bare on lower portion. Antenna with flagellar segments in proportion of 18:15; 15:19:19:19:19:19:19:20:19:41, antennal

ratio 0.80, distal sensory tufts present on segments III, VII–X. Palpal segments in proportion of 6:18:20:6:7, third segment distinctly swollen, about twice as long as greatest breadth, with a broad, shallow sensory pit. Mandible in wrong position to count teeth. Mesonotum dark brown, without apparent pattern (but may be due to being a slide mount); scutellum, postscutellum, and pleuron uniformly dark brown. Legs dark brown, femora entirely dark, tibiae with sub-basal pale rings, hind tibia with apex broadly pale, comb with four spines, the second from the spur longest.

Wing with pattern as figured, second radial cell rather long and narrow, costa extending to 0.60 of distance to wing tip. The three pale spots in cell  $R_5$  arranged in a triangle, the two poststigmatic pale spots in cell  $R_5$  small and well separated, the posterior one located far proximal of the anterior one, distal spot in cell  $R_5$  rounded except on distal side. Two pale spots in cell  $M_1$ , only one pale spot each in apices of anal cell and cell  $M_2$ , no pale spot present anterior to medio-cubital fork but an indistinct pale spot present behind base of medial fork. Macrotrichia sparse, in rows, in apices of cells,  $R_5$ ,  $M_1$ , and  $M_2$ . Halter pressed against thorax, not visible in profile, its color undetermined.

Abdomen dark brown, cerci pale; spermathecae two, slightly unequal, collapsed and impossible to measure, apparently pyriform, with the ducts sclerotized a considerable distance.

*Specimens examined*.—Macfie (1940, Ent. Monthly Mag. 76: 27–28) described this species and *debilipalpis* var. *glabrior* each from a single female from New River, British Guiana, collected in February and March 1938 by C. A. Hudson. In response to our inquiry regarding the types of *germanus* and *glabrior* Paul Freeman of the British Museum (Natural History) stated that the only material of these species which he could find in the Macfie collection in the Museum was one slide on which were mounted two females, without locality data, but bearing only the label in Macfie's handwriting, "*Culicoides/ debilipalpis* Lz. / v. *glabrior* / ♀ (large specimen) / *C. germanus* / ♀". After careful study we can only conclude that these specimens are in fact the types of *glabrior* and *germanus*, and the smaller specimen is here redescribed as the presumed type of *germanus*. The larger specimen will be redescribed elsewhere as the presumed

type of *glabrior*. To our knowledge *germanus* is still known only from the type specimen.

*Discussion.*—*Culicoides germanus* is very closely related to *debilipalpis* Lutz and *hoffmani* Fox but can be distinguished by the very hairy eyes, the presence of sensoria on the seventh antennal segment, the entirely dark femora, and the greater separation of the two proximal pale spots in cell  $R_5$ .

The description and figures given under the name of *germanus* by Wirth (1955, Proc. Ent. Soc. Washington 57: 111) from Guatemala specimens are based on misidentifications of *gabaldoni* Ortiz. *Culicoides insinuatus* Ortiz and Leon, 1955, from Ecuador is very similar to *germanus*, with similar wing pattern and femora without subapical pale rings, but *insinuatus* differs in having a very deep sensory pit with a small pore on the third palpal segment.

#### *Culicoides trilineatus* Fox

Fig. 3

*Culicoides trilineatus* Fox, 1946, Ann. Ent. Soc. Amer. 39: 250 (female; St. Thomas, Virgin Islands; biting man; fig. mesonotum, wing); Fox, 1949, Bull. Brooklyn Ent. Soc. 44: 30 (male, female; Puerto Rico; reared, tree hole; fig. palpus, spermathecae, male aedeagus, parameres).

*Characters of female.*—Length of wing 0.97 (0.92–1.02,  $n = 7$ ) mm.

Head: Eyes broadly separated, bare. Antenna with flagellar segments in proportion of 19:15:15:17:17:15:15:15:17:18:19:20:33, antennal ratio 0.86 (0.82–0.94,  $n = 3$ ); distal sensory tufts present on segments III, sometimes on V, always on VI–X. Palpal segments in proportion of 13:24:30:10:12, third segment slightly swollen toward extreme tip, 2.6 (2.3–3.0,  $n = 7$ ) times as long as greatest breadth, with a shallow, small, sensory pit. Mandible with 18 (17–18,  $n = 7$ ) teeth.

Thorax: Mesonotum grayish brown, with a prominent dark-brown pattern consisting of three longitudinal lines connected posteriorly by a transverse line just in front of prescutellar depression, the two lateral lines continued caudad along sides of this depression and extending from humeral pits to sides of scutellum; lateral margins dark brown with mesal extensions anteriorly to humeral pits and posteriorly along mesonotal suture. Scutellum dark brown, ends slightly paler; postscutellum and pleuron dark brown. Legs brown, fore and mid knees dark, with

narrow pale rings on each side of joint, hind tibia with pale band at base and apex; hind tibial comb with 4 ( $n = 7$ ) spines, the second from the spur longest.

Wing: Pattern as figured, a double poststigmatic pale spot in cell  $R_5$ , the posterior portion extending slightly proximad of the anterior part; distal pale spot in cell  $R_5$  small, transverse; proximal spot in cell  $M_1$  very small, one small pale spot in apex of anal cell, no pale spot in front of mediocubital fork but a pale line connecting pale spot behind medial fork to a distinct subapical, second spot in distal portion of cell  $M_2$ . Macrotrichia very long and abundant, extending to base of wing in anal and medial cells; costa extending to 0.57 of distance to wing tip. Halter brownish, the flat end paler.

Abdomen: Dark brown; spermathecae two, pyriform, subequal, measuring 0.056 by 0.039 mm, the bases of the ducts sclerotized a short distance.

*Distribution.*—St. Thomas (type locality); Puerto Rico, Barbados, St. Croix.

*Specimens examined.*—60 females from:

BARBADOS: 1, no. 861, A. J. Jennings.

VIRGIN ISLANDS: St. Croix—3, Diamond School, September 1938; 1, Fountain, valley of jungle and stream 1 mile from seacoast, May 1935; 15, Salt River, September 1938; 11, Tagus Pond, May 1936; all collected by H. A. Beatty. St. Thomas—Red Hook, September 11, 1937, biting in the afternoon (holotype of *trilineatus* lent from Univ. Puerto Rico collection through the courtesy of Irving Fox).

*Discussion.*—This species is obviously closely related to *debilipalpis* Lutz but can be readily separated by its prominent mesonotal pattern, its hairier wings, with reduced pale spot at base of cell  $M_1$ , no pale spot before mediocubital fork, the third palpal segment shaped differently, and the greater number of proximal antennal segments with sensoria.

#### *Culicoides hoffmani* Fox

Fig. 4

*Culicoides hoffmani* Fox, 1946, Ann. Ent. Soc. Amer. 39: 251 (female; Cumuto Village, Trinidad; biting; fig. mesonotum, wing); Fox, 1949, Bull. Brooklyn Ent. Soc. 44: 29 (male, female; Puerto Rico; reared, tree hole; fig. palpus, spermathecae, male aedeagus, parameres).

*Characters of female.*—Length of wing 0.76 (0.73–0.86,  $n = 9$ ) mm.

Head: Eyes separated, the line of separation broad above but narrowed below, eye with short interfacetal hairs. Antenna with flagellar segments in proportion of 14:11:13:15:15:14:14:15:14:14:15:15:25, antennal ratio 0.79 (0.75-0.84,  $n = 3$ ); distal sensory tufts present on segments III, VIII-X. Palpal segments in proportion of 6:11:19:6:7, third segment very short and swollen, 1.6 (1.5-1.7,  $n = 9$ ) times as long as greatest breadth, with a moderately large and deep sensory pit. Mandible with 14 (13-15,  $n = 5$ ) teeth.

Thorax: Mesonotum pruinose brown with pattern as figured, consisting essentially of a sublateral pair of darker brown patches, widest at midlength; scutellum, postscutellum and pleuron dark brown. Legs dark brown; fore and mid femora with subapical, all tibiae with subbasal and hind tibia with apical, narrow pale rings; hind tibial comb with 4 ( $n = 9$ ) spines, the one nearest the spur longest.

Wing: Pattern as figured; two slightly separated, poststigmatic pale spots in cell  $R_5$ , the posterior one lying only slightly proximad of the anterior one; distal pale spot in cell  $R_5$  moderately large, rounded; two pale spots in cell  $M_1$ ; one pale spot each in apices of cells  $M_2$ ,  $M_4$  and anal cell, the one in anal cell failing by its own diameter to meet wing margin; a pale spot lying in front of mediocubital fork and another pale spot lying behind medial fork; macrotrichia sparse on distal third of wing, none in anal cell, cell  $M_4$  or base of cell  $M_2$ ; costa extending to 0.59 (0.57 - 0.62,  $n = 9$ ) of distance to wing tip. Second radial cell well developed. Halter brown, the flat end of knob whitish.

Abdomen: blackish, cerci pale; spermathecae two, pyriform, slightly unequal, measuring 0.048 by 0.034 and 0.043 by 0.031 mm.

*Male genitalia*.—Ninth sternum with very broad and shallow caudomedian excavation, the posterior membrane bare; ninth tergum long with large, triangular, apicolateral processes. Basistyle with ventral root large and foot-shaped, dorsal root slender; dististyle slender and nearly straight with hooked apex. Aedeagus with basal arch rounded caudad, extending to slightly more

than half of total length, basal arms slender and curved; distal apex broadly expanded with three pointed lobes of subequal lengths. Parameres each with knobbed base, stem abruptly bent near base, very slender, mid-portion sinuate, no trace of ventral lobe, apex pointed with lateral fringe of fine hairs.

*Distribution*.—Trinidad, Puerto Rico.

*Specimens examined*.—As follows:

TRINIDAD: Cumuto Village, June 11, 1941, biting, 1 female (holotype from University of Puerto Rico collection). Cumaca, June 16, 1954, Aitken and Downs, biting man, 2 females. Macqueripe, October 20, 1955, T. Aitken, light trap, 1 female. Melajo Forest, Sangre Grande, October 19, 1955, T. Aitken, biting man, 1 female. Port of Spain, June 1953, U. S. Army, 25 Med. Det., light trap, 2 males, 3 females. St. Pats, Arima, December 31, 1954, W. G. Downs, 1 female; December 10, 1954, T. Aitken, 4 females.

PUERTO RICO: Carolina, September 20, 1949, I. Fox, reared from tree hole, 3 males. Guyanilla, March 1949, I. Fox, reared from tree hole, 2 females. Mamayes, November 5, 1948, I. Fox, treehole, 1 male, 1 female.

VIRGIN ISLANDS: St. Croix, August 1935, H. A. Beatty, 6 females.

*Discussion*.—*Culicoides debilipalpis* Lutz, which is also common in Trinidad and the Antilles, can be distinguished by its slightly larger size (wing 0.80 mm long), longer, more slender palpus, the third segment 2.2 times as long as broad, with a small, deep pit, the second segment subequal in length to the third; wing hairier, macrotrichia extending in two lines to base of cell  $M_2$  and numerous in anal cell, and the two post-stigmatic spots in cell  $R_5$  more closely approximated and the posterior one located more distinctly proximad of the anterior one.

*Culicoides equatoriensis* Barbosa from Ecuador resembles *hoffmani* in wing markings, in restriction of the macrotrichia to the distal half of the wing, and in the possession of a broad shallow palpal pit but, according to the original description, differs in having the third palpal segment slightly longer, the eyes bare and contiguous, and subapical pale rings on all three pairs of femora.